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DISEASES

OF THE

CHEST

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Editorial Comment

WILL YOU HELP?

WE again urge the readers
of **DISEASES OF THE
CHEST** to support the an-
nual *Christmas Seal Sale* of the National,
State, and County Tuberculosis Societies.

Tuberculosis is still the leading cause of
death in the age group of 18 to 35. The
national death rate has reached a "stale
mate". For 30 years we have been able
to record a steady decline in the death
rate. To-day, for the first time, a number
of states are showing an increase in their
death rate from tuberculosis. Which way
is the pendulum going to swing?

With our present knowledge of tuber-
culosis, we can materially assist in guid-
ing the direction of the pendulum. If we
are alert in diagnosing our cases early,
and if we will institute correct treatment
early, we need have no fear as to which
way the pendulum will swing.

By supporting the program of the Na-
tional and Local Tuberculosis Societies,
we can further assist in determining the
direction of the pendulum. It is our aim
to keep the pendulum swinging down-
wards. **WILL YOU HELP?** C. M. H.

THE UNSUSPECTED MENACE

WHEN a child in the
pre or early school age
shows a positive tuber-
culin reaction, the pre-
sumption is that this child was infected

by the tubercle bacillus within its im-
mediate environment, and this usually
means the home. The younger the child,
the more sure is this true. The tuberculin
test has in this manner ushered in another
chapter of case finding. In this way cases
of open tuberculosis have been brought to
light which previously were entirely un-
suspected. The old uncle, aunt, or grand-
parent with his or her "chronic bron-
chitis" or "asthmatic cough" has been
allowed to go freely, if not merrily, on
his way, spraying tuberculosis germs.

Tuberculosis in the elderly very often
assumes a benign appearance. The in-
dividual may appear to be in a fair or good
state of health, is not toxic, and the cough
and expectoration are usually attributed
to some chronic bronchial disorder. The
pathological condition in the lungs of
these persons is often a fibro-ulcerative
one, and the sputum is loaded with tu-
bercle bacilli. It has been the experience,
the tragic experience of many, to find in
the household of an infant dying from a
tuberculous meningitis the type of open
case referred to above.

It should be an iron bound rule to ex-
amine every member in the home of the
child having a positive tuberculin reac-
tion; or where an infant or young child
develops any form of tuberculosis. Par-
ticularly beware of the middle aged or

elderly member in the group with the chronic cough. It is needless to counsel that when the source of infection is discovered, the future health of the child demands that the contact be broken. The welfare of the community demands that this source of infection be dammed up or isolated.

C. H. H.

PHILADELPHIA PLAN BECOMES PENNSYLVANIA PLAN!

IN the November, 1937, issue of **DISEASES OF THE CHEST**, was outlined the Philadelphia Plan of Tuberculosis Organization within Organized Medicine. The Pennsylvania State Medical Society has endorsed this plan and its President, Doctor Frederick J. Bishop of Scranton, Pa., has appointed the Chairman of the Tuberculosis Committee of the Philadelphia Society to the Chairmanship of the new Tuberculosis Committee of the State Society. A member will be appointed to this Committee from each of the twelve Councilor Districts of the State. The Subcommittees of the State Tuberculosis Committee will be formed along the same pattern as the Philadelphia County Medical Society Committee. An effort is being made to have similar committees in every county in Pennsylvania. When this organization is completed, then, we will have Subcommittees for every phase of our work in every county of the State, bound together by a similar subcommittee of the State Society Tuberculosis Committee.

It is hoped that the Fellows of the American College of Chest Physicians throughout the United States will take a leading part in organizing Tuberculosis Committees in every County Medical Society and State Medical Society. These committees should by united effort help to locate the weak spots in the Tuberculosis program of their respective states, determine a plan of action to correct the deficiencies, and then "carry through" until their objective is reached. For example, in Pennsylvania we are faced with woeful inadequacy in the number of physicians in our state sanatoriums. Correction of that condition will be one of our first

objectives.

To organized medicine falls the duty of upholding standards of treatment and a balanced tuberculosis program.

We are receiving excellent cooperation and advice from the component societies of the National Tuberculosis Association, The Philadelphia Health Council and the Pennsylvania Tuberculosis Association. Only by the sincerest cooperation with all tuberculosis agencies can we successfully carry out our program.

We believe that the National Tuberculosis Association deserves our fullest active, organized support in their educational program and that they should have had it these many years.

The American College of Chest Physicians has the duty of standardizing and improving tuberculosis education in medical schools and keeping the physician tuberculosis conscious both as to early diagnosis and modern treatment. F. W. R.

WHAT TO READ

THE American College of Chest Physicians through its journal, *Diseases of the Chest*, is happy at any time to lend wise counsel both to its members and readers. Reading material on tuberculosis is a rather important question; and it is therefore the purpose of this particular editorial to refer to a few works which have made their advent into the literature more or less recently.

Just off the press is the admirable work, "The Collapse Therapy of Pulmonary Tuberculosis," edited by Dr. John Alexander. It is a massive work but should be in the library of everyone engaged in collapse therapy. This reviewer has not yet completed a thorough reading of it, having had it for only a few days; but he has reviewed it to an extent sufficient to appreciate the tremendous value it affords to the specialist, medical and surgical alike. The Book contains 705 pages, and is published by Charles C. Thomas.

Dr. Fred Heise, of Saranac Lake, has compiled into an attractive little book of 232 pages a thousand questions and answers on Tuberculosis, and the work goes under that name. The questions were the

representative ones submitted by patients. It is valuable therefore to the doctor in that it reflects the questions turning over in the minds of his patients, in giving an insight into their reactions, interests, and curiosities toward their disease. The sum total of the answers provides quite a complete array of informative data on tuberculosis. The value is obvious as an answer to the questions of present, past, and prospective patients. This fine little book should be in the possession of all doctors. It is published by The National Tuberculosis Association.

The last book to be recommended in this present editorial (and others are to follow) is that excellent book by Fred Holmes — "Tuberculosis". This again is an excellent book for both the doctor and the tuberculosis patient. It is written in an attractively lucid style and is a complete running story of the patient with tuberculosis from the initial examination on through the whole gamut of subsequent experiences. Any one knowing Fred Holmes, who himself went through the mill, can feel the force of his striking personality on every page. This book not only imparts an enormous amount of information, but serves to bring doctor and patient into a closer, more intimate, more understanding relationship. It contains 311 pages, and is published by D. Appleton-Century Co.

C. H. H.

IMPORTANCE OF SPUTUM TESTS IN DIAGNOSING PULMONARY TUBERCULOSIS

THE least expensive procedure in Tuberculosis Diagnosis is sputum examination. Every state in the Country has facilities for free performance of this test for those unable to pay for it. It alone can "clinch" the diagnosis beyond reasonable doubt.

Every physician should provide himself with plenty of bottles from private and free laboratories, and use the appropriate one for every patient who coughs up sputum, irrespective of the duration of the cough. Many chronic tuberculosis patients only expectorate noticeably when they have a cold, and yet spray enough tuberculosis germs to give the baby tuberculous meningitis and cause other members of the family to break down later on.

If the doctor does not have bottles on hand before the patient comes in, there is a temptation to neglect the sputum examination which he knows perfectly well should be made. The bottle should be addressed to the laboratory, so the doctor is freed of all annoyance.

In a statistical survey of 361 tuberculosis cases made by Ruth Abelson Seder, published by the National Tuberculosis Association in 1934, it was noted that *but 14 per cent* of those who received a physical examination only, received their diagnosis of Tuberculosis within two weeks of their first visit to the doctor, but that of those patients who had a physical examination and a sputum test, *84 per cent* were positively diagnosed within two weeks of their first visit.

F. W. B.

CHANGES IN DISEASES OF THE CHEST

BEGINNING with the January, 1938 issue; DISEASES OF THE CHEST will take on a new appearance. The cover will be more attractive, the inside paper will be heavier, and the journal will be a bit wider in format.

The scientific papers will remain of the same high standard as heretofore published; and they will be contributed by recognized authorities in the specialty of chest diseases. The editorial policy will continue to stress the cooperation between the specialist and the physician in the general practice of medicine; and the keynote of the journal will continue to be early diagnosis and proper treatment for chest diseases.

We trust that you will celebrate with us this new and improved DISEASES OF THE CHEST by renewing your subscription to the journal.

F. W. B.

BAYARD T. CRANE

It is with deep regret that we announce the death of Dr. Bayard T. Crane of Rutland, Massachusetts, Medical Director of the Central New England Sanatorium. Dr. Crane devoted all of his life to the problems of the tuberculous. His latest achievement was the establishing of a rehabilitation project in connection with his Sanatorium at Rutland. Dr. Crane passed away at his home on August 14th at the age of 59.

C. M. H.

Pneumoperitoneum

THE realization of the idea that artificial pneumoperitoneum is of value in the treatment of pulmonary tuberculosis was forced upon me by a technical error while giving artificial pneumothorax to one of our patients in 1931. This patient had a far-advanced bilateral pulmonary tuberculosis. An exeresis of the left phrenic nerve caused an elevation of the left dome of the diaphragm of only one finger's breadth. Subsequent events proved that the nerve block was insufficient to check the progress of the disease. The patient had a massive hemorrhage. Artificial pneumothorax was started immediately, in spite of the fact that such attempts ended in failure before the phrenic block because of extensive pleural adhesions. The patient was given eight inflations, the amounts of air varying from 100 to 800 cc. The final manometer readings were four times on the positive side. At the ninth attempt the initial manometer reading was -5 and the inflation was closed with a -1 reading after the injection of 1000 cc. Roentgenograms showed at that time that an artificial pneumoperitoneum was established instead of the intended pneumothorax. The benefits of pneumoperitoneum were noticed by the patient as well as by the attending staff. The recurring hemorrhages were stopped and the appetite and general condition improved under the effect of continued pneumoperitoneum treatment.

Reviewing a rather large group of patients in whom I used pneumoperitoneum for intestinal tuberculosis since 1929, some of our unexplainable observations became self-evident. At that time I was using oxygen for the injections and thought that the immediate euphoria and the disappearance of toxic symptoms often seen in my patients in a few days or weeks after the beginning of the treatment were attributable to the absorption of oxygen, that supposedly relieved anoxemia and acted as a mild cardiac and respiratory stimulant. The use of air instead of oxy-

BY

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gen during the past few years convinced me that the cause of the benefits of pneumoperitoneum must be sought in the

mechanical effect of the injected gas rather than in its chemical action.

Roentgenological studies prove that the injection of moderate amounts of air (400-1500 cc.) at weekly intervals causes a sustained elevation of the diaphragm equivalent to or better than a *bilateral* phrenic nerve block. The direct and late therapeutic changes that follow the elevation of the diaphragm are like those seen in artificial pneumothorax. Pneumoperitoneum induces a relaxation of the lung. The basic principle of cure of tuberculosis in any organ is physiological rest for the diseased part. Pneumoperitoneum reduces the size of the lung to a stage that closely corresponds to its *natural* state of relaxation as seen during the expiratory phase. As in artificial pneumothorax, relaxation of the lung is followed by a passive hyperemia and by an increased carbon dioxide content of the relaxed tissues. It has been noted by clinicians that patients with certain types of heart disease, which cause a long-standing passive congestion of the lung, suffer only rarely from active pulmonary tuberculosis. The relative infrequency of pulmonary tuberculosis in atrophic emphysema is attributed to the venous hyperemia of the lung.

The relaxation of the lung is followed by an increased drainage of inflammatory products from cavities and from the bronchial tract. The amount of sputum evacuated with very slight cough or effort following the institution of this treatment was rather surprising to the patients and to ourselves. Effective pulmonary drainage is likely to lead to a diminution in the toxic manifestations of the disease. Herein lies, therefore, the explanation of the euphoria that we formerly attributed to the use of oxygen. Following the effective drainage of the lungs, the cough is, usually, considerably decreased. Decreased cough is conducive to better, more quiet, and relaxed sleep and thus indi-

rectly to more rest of the entire body and to an improvement of the general subjective feeling. Pulmonary relaxation accompanied by increased freedom from cough means a better chance for the defense and repair of the diseased tissues.

Another important aspect of the effect of pneumoperitoneum is that the air that collects underneath the diaphragm supports this muscle in its expiratory motion, that is, pneumoperitoneum makes coughing and expectoration easier. Spells of protracted, strenuous cough are changed to an easy, almost effortless expectoration in many instances. As the result of effective cough and expectoration, I have seen often times that the patients' dyspnea was relieved and they were able to move around with more comfort and less shortness of breath than before. It has been my experience that the dyspnea of patients who have a marked basal emphysema, that is secondary to a long-standing tuberculosis, can be best relieved by pneumoperitoneum.

Decrease in size of cavities or their complete obliteration are directly attributable to the rise of the diaphragm. It must be remembered that, unless extensive adhesions prevent them, mechanical measures such as pneumothorax, phrenic nerve block, and pneumoperitoneum cause a relaxation of the diseased portions of the lung more readily than that of the healthy areas. A selective relaxation and a selective therapeutic effect can be produced in any part of the lung without a direct approach, that is, for instance, without putting the air directly over the diseased part of the lung.

Our fluoroscopic and roentgenographic studies revealed that, in many instances, the diaphragm was not only elevated but also its respiratory motions were restricted. The rest thus insured for the tuberculous lung is an important feature of pneumoperitoneum treatment.

Technique

The following points are of great practical importance. 1. Fluoroscopic examination of each case for the purpose of determining whether the diaphragm is

moving or not. If the respiratory motion is absent, (except in cases of previous phrenic nerve block), because extensive adhesions fix the diaphragm to the chest wall, little, if any, benefit can be expected from pneumoperitoneum. 2. In patients with severe cough an adequate dose of codein is given one hour before treatment. 3. The bladder should be evacuated just before the injection. 4. For the first treatment the patient is taken to and from the operating room on a cart. This is done to avoid sudden pain in the shoulder region when the patient sits up. On subsequent occasions a wheel chair is used or the patient is treated as an ambulatory case. 5. The operating table should be in a slightly slanting position, head elevated. This causes the injected air to collect underneath the diaphragm sooner than having the patient in the horizontal position, thereby making detection of air by percussion easier. 6. The best site for injection is three fingers' breadth below and to the left of the umbilicus. I prefer to use the same site during the entire course of treatment. The familiarity with the thickness and resistance of the abdominal wall at a certain point facilitates the introduction of the needle. 7. Strict asepsis should be observed as in artificial pneumothorax. 8. A standard pneumothorax apparatus is used with a Floyd-Robinson needle. The handle of this needle ensures a firm grasp and an easy handling. 9. Local anaesthesia should precede every injection. Use 5 cc. of a 1 per cent novocain solution and infiltrate the peritoneum well. 10. By elevating a skin fold between the thumb and index finger a small skin incision is made to aid the smooth insertion of the needle. 11. The obturator of the needle prevents its being obstructed by blood clots or tissue particles. The needle should be pushed gently. One can feel as it passes through the different layers of the abdominal wall. Avoid a sudden, jerky paracentesis. It happens sometimes that the inserted needle glides on the sheets of the rectus muscle. This might give the wrong impression that the point of the needle reached the peritoneal cavity. In such a

case, it should be slightly withdrawn and then pushed through the tissues to prevent gliding. The direction should be perpendicular or slightly oblique. The depth of penetration should be judged by the apparent thickness of the abdominal wall and by the disappearance of resistance in front of the point of the needle. If not sure that the needle has gone through the abdominal wall, push it deeper rather than to have its point in the abdominal wall and inject air into one of the large blood vessels thus causing air embolism. The danger of puncturing the intestines is remote. If the needle is *slowly* forced inward, the omentum and the intestines being soft, pliable and movable, are pushed in front of the needle but are not punctured. 12. At the first insertion, the manometer registers a *neutral* pressure in this part of the abdomen. Positive pressure, with or without oscillations appears, usually, after the injection of 300 to 500 cc. of air. If the point of the needle did not reach the abdominal cavity, but is lying in the tissues, or if one is dealing with a case of adhesive peritonitis, the manometer will register a rather high positive pressure following the injection of 50 cc. of air. With some experience, one is able to judge from the speed of the flow of air whether or not the point of the needle went through the abdominal wall. On repeated treatments the manometer registers a positive pressure (fixed or oscillating) in most, but not in all, cases. Thus, the manometer is a useful guide in continued treatment. 13. The "second" bottle of the pneumothorax apparatus is elevated to force the air into the abdomen. If the air-flow is free, a bulb put on the "second" bottle can be used for the quick completion of the inflation with safety. 14. The amount of air injected at the first treatment varies from 500 to 800 cc. This is gradually increased to from 800 to 1500 cc. As the treatment advances, the amount should be regulated according to the desired upward displacement of the diaphragm, the integrity of the abdominal wall, and the sensitiveness and cooperation of the patient. Periodic fluoroscopic

examinations are of great help. The treatments are given at weekly intervals, and are continued from few months to two years. 15. The appearance of pain in the shoulder region following the injection of 300 to 400 cc. of air is a useful indicator of a correctly performed pneumoperitoneum. This is caused by the pressure of the injected air upon the diaphragm. The sensation is transmitted through the phrenic nerve to the neck and from there it radiates to the shoulder. It is a good policy to tell the patient about this and about the abdominal tightness before the treatment is started. As the treatment is continued the patient gradually adapts himself to the increased intraabdominal pressure, and it can be carried on with very little or no discomfort at all. Patients who have had a previous phrenic nerve block rarely complain of the shoulder pain on the operated side. 16. The percussion of the area of the liver by one hand of the operator himself before and during the injection is important. The disappearance of the liver dullness and the appearance of a tympanitic percussion sound in this region signify that the operation was successful, that is, the injected air reached to underneath the diaphragm. The tympanitic percussion note is detectable, usually, after the inflation of 300 to 500 cc. of air. 17. As soon as the patient is used to the increased intraabdominal pressure, he is instructed to spend his rest periods in a semi-sitting position for the purpose of forcing the largest possible part of the injected air to underneath the diaphragm and thereby increasing its upward lifting effect. 18. Postural rest is of additional value in unilateral cases. When the patient is lying on the "good" side, the injected air is likely to exert its force upon the upper dome of the diaphragm, that is, upon the diseased lung. 19. A snugly fitting abdominal binder aids the upward displacement of the diaphragm. 20. Hazards and complications are few, if any, with proper technique. In numerous injections I have not seen an injury to the deep epigastric artery, mesenteric vessels or intestines. Air embolism, hemorrhage,

major peritoneal shock, or peritonitis caused by the treatment did not occur in my practice. I encountered three cases of interstitial emphysema, that disappeared rather rapidly, and one instance of accidental pneumothorax, while giving pneumoperitoneum by the subdiaphragmatic route. Speaking of peritonitis as a possible complication, one must remember that some of the tuberculous patients develop exudative or adhesive peritonitis without pneumoperitoneum. This is best illustrated by two of my cases. In one it was impossible to establish pneumoperitoneum on repeated attempts because of an old adhesive peritonitis; in the other case, a few days before the patient was scheduled to begin his treatment, he developed a large tuberculous ascites.

Indications

1. If artificial pneumothorax is indicated but cannot be established. *In unilateral cases better results follow pneumoperitoneum if it is preceded by a phrenic nerve block.* 2. Severe pulmonary hemorrhage when artificial pneumothorax cannot be induced. 3. Following pregnancy if artificial pneumothorax is impossible or inadvisable because of an extensive bilateral tuberculosis. I have no doubt that the improvement seen in some of our tuberculous women during pregnancy is due to the marked rise of the diaphragm that exerts a relaxing effect upon the lungs, not unlike an effective pneumoperitoneum. The disastrous influence of pregnancy upon the tuberculous lung begins after the delivery when the previous elevation of the diaphragm is lost, the lungs reexpand, cavities reopen and diseased tissues are again subjected to the wear and tear of respiratory stretching and to the ravages of coughing. Herein lies the rationale of artificial pneumoperitoneum following pregnancy. 4. If after pneumothorax had been discontinued and the tuberculous process becomes reactivated but pneumothorax cannot be reestablished. 5. If the tuberculous lesion is too extensive for bilateral pneumothorax. 6. If bilateral pneumothorax is disregarded because of the advanced

age of the patient. 7. In addition to artificial pneumothorax in which the relaxation of the basal portion of the lung is desirable but cannot be accomplished by pneumothorax alone. 8. In addition to a phrenic nerve block in which the elevation of the diaphragm is unsatisfactory. 9. In addition to a phrenic nerve block in which disturbing gastro-intestinal symptoms develop after the operation because of the upward dislocation and torsion of the stomach. Pneumoperitoneum separates the stomach from the diaphragm, restores or improves its function. 10. In addition to a mechanically satisfactory phrenic nerve block when the sputum remains persistently positive. 11. In bilateral pulmonary tuberculosis complicated by intestinal or peritoneal tuberculous lesions. 12. Pulmonary tuberculosis complicated by basal bronchiectasis. 13. Marked basal emphysema complicating pulmonary tuberculosis. 14. Allergic asthma complicating pulmonary tuberculosis.

Contraindications

1. Generalized tuberculosis. 2. Amyloidosis. 3. Diseases of the aorta or the coronary arteries. 4. Marked arteriosclerosis. 5. Cardiac decompensation. 6. If the pulmonary process is so extensive that the vital capacity of the lungs is less than one-third of normal.

Conclusions

Clinical experience shows that artificial pneumoperitoneum is a valuable adjunct in the mechanical treatment of pulmonary tuberculosis. Its purpose is to assist Nature in its curative tendencies by relaxing the involved lung, by decreasing the size of and partially immobilizing the diseased organ. It should not be used as a last resort. On the contrary, a great many patients who are on the so-called routine sanatorium care should be offered the benefits of this treatment, provided they are eligible for it. Undue delay means, often times, the spread of the disease, the stiffening and thickening of the walls of cavities, the formation of heavy adhesions, and the break-down of the forces of resistance, defense and repair.

It must be recognized that some patients do not respond to artificial pneumoperitoneum treatment, although mechanically it appears to be satisfactory. Because of the complex problem of tuberculosis, no explanation of these failures is attempted here. I wish to emphasize, however, that it is a simple, feasible and safe treatment that should be used in the every day practice of tuberculosis physicians if not for curative at least for palliative purposes.

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Present Day Conception of Tuberculosis in the Male Genital Tract *

IT MAY be well to state briefly the facts that are known at present relative to genital tuberculosis in the male. It is important that the medical profession should be kept informed of the progress that has been made in this field, for in no class of urological cases can the general practitioner be of greater service than in the management of cases of tuberculosis.

BY
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Pathogenesis

It is generally believed that genital tuberculosis is secondary to some other focus in the body. The focus is most frequently found in the respiratory tract. It is agreed that the infection may reach the genital tract by way of the blood stream, lymphatics or by continuity of tissue. At the present time there are two schools of thought on the pathogenesis of this condition.

Young's studies seem to prove conclusively that whereas the epididymis attracts most attention, and gives more pronounced symptoms, especially at the outset, the seminal vesicles and the prostate are, in fact, the primary and principal seat of the tuberculous process.

The seminal vesicles are not only the primary focus from which the epididymis is involved, but from which also the prostate, bladder and the kidneys, in many

cases are involved. It is extremely common to find genital and renal tuberculosis in the same patient. In others while urinary tuberculosis cannot be proved, it is often suspected. In the diagnosis of genital tuberculosis, evidence of a tuberculous lesion in the urinary tract should be sought.

Menville in a survey of a group of cases at the Mayo Clinic also found that the prostate gland and seminal vesicles were the organs most frequently involved in tuberculosis of the genital tract in the male. Braasch discussing Menville's paper expresses the opinion that the prostate and seminal vesicles are most frequently involved.

Greenberger and Alexander have shown that in unilateral lesions of the seminal vesicles, epididymis and testes, there was no evidence of cross infection. For example they found no cases of right seminal vesicle and the left epididymis involved. Our findings agree with this.

Barney, Caulk, Hinman and many others believe that the epididymis is the seat of primary genital involvement, and are of the opinion that the infection is hematogenous in origin.

In the opinion of Horace E. Campbell, genital tuberculosis without involvement of the kidneys is an hematogenous infection and starts in the epididymis, whereas with renal disease tuberculosis reaches the genital tract by way of the urinary

*From the Urological Service of the Sanatorium of the Jewish Consumptives Relief Society.

passages. The tuberculous urine bathing the prostatic urethra causes the prostate and seminal vesicles to be involved first. He stresses the role of the avascular vas deferens as a focus, which most probably by extension along its lumen or possibly by extension along the lymphatics, keeps the vesicles and prostate constantly reinfected.

Moore gives histological or correlative evidence that the bacilli in most cases reach the prostate and seminal vesicles through the blood stream and that the prostatic lesion is secondary to other urogenital lesions in less than twenty per cent of the cases.

Summarizing then there are two general theories concerning the pathogenesis of tuberculosis of the male genital tract:

1. That the prostate and seminal vesicles are involved primarily in the urogenital system, and that the disease may remain localized or spread as a descending genital or ascending urinary tuberculosis.

2. That the prostate and seminal vesicles are involved secondarily from other urogenital organs by dissemination through the lumina or walls of hollow viscera connecting them; specifically, ascending genital or descending urinary tuberculosis.

We conclude from the clinico-pathological facts that the disease most often starts in the vesicle and prostate but may occasionally start in the epididymis. Genital tuberculosis is primarily a disease of the structures apart from the testis, the orchid remaining intact in the presence of extensive long standing disease of the epididymis, only becoming involved by extension very late. In the large majority of cases both epididymides eventually show clinical evidence of the presence of tuberculosis though there may be an interval of some months before this is observed.

The extent of the disease in the genital tract varies quite markedly. The initial or early symptom of genital tuberculosis is not nearly so definite as in renal tuberculosis. The commonest finding, of course, is epididymitis evidenced by

nodules that would seem invariably to involve first the globus minor. The globus minor shows involvement in hundred per cent of cases, the body of the epididymis in ninety per cent, and the globus major in only sixty-six per cent. In other words, in every tuberculous epididymis that shows tubercles in the globus major or body, there will also be tubercles in the globus minor. Those cases with primary involvement of the vesicle or prostate may show an early disturbance of urination or some abnormality of the urine but the most valuable diagnostic evidence of tuberculous involvement of the deeper genital structure is that obtained on rectal palpation, nodulation being the characteristic change.

A question constantly asked by patients suffering from this disease is whether by coitus their partner can become infected. A negative answer may be given with every assurance. Apparently the spermatozoon is never a carrier of the bacillus, nor has it been proved that the prostatic fluid harbors this organism. It is our opinion that there is no danger because the genito-urinary system can certainly never be the portal of entry for a tuberculous infection into the human body.

Incidence

It is generally accepted that clinical evidence of tuberculosis of the male genital tract occurs during the age of greatest sexual activity, and the vast majority of patients range from twenty to forty years of age. However, genital tuberculosis may occur at any age as the Greenberger and Alexander series show patients ranging from two years to sixty-seven years of age. It is well recognized that the younger the patient, the more virulent is the tuberculous infection.

Of the 1314 male patients admitted to the Sanatorium of the Jewish Consumptive Relief Society in the 10-year period between 1927 and 1936, 36 patients suffered from clinical genital tuberculosis giving an incidence of 2.75 per cent. These figures compare favorably with the 6 cases reported from the Whipp Cross Hospital, England, of 334 patients admitted suf-

fering from tuberculosis giving an incidence of approximately 2 per cent.

Investigation of a Case of Suspected Genital Tuberculosis

As has already been pointed out, involvement of the sexual organs is only a local manifestation of a generalized infection and the portal of entry of the bacillus into the human body can never be any part of the genito-urinary tract. The outlook on this disease, therefore, should extend far beyond the sexual apparatus.

1. Examination of the Chest: The lungs must be carefully examined to rule in or rule out a pulmonary focus. As part of this investigation consists of an x-ray examination of the chest, evidence as to the presence of tuberculous glands will be forthcoming.

2. Examination of the Urine: A positive finding of tubercle bacilli in smear, culture, or guinea pig inoculation, clinches the diagnosis and proves that the source of the infection comes directly from the urinary tract. On the other hand, a normal urine will lead to the suspicion of a blood-borne infection.

3. Examination of the External Genitalia: It is important that the patient should be standing up facing the surgeon so that observations can be made of any alterations in the normal rugose appearance of the skin of the scrotum, the shape of the testicles, and their relative positions one to the other. Changes in the scrotal skin are sometimes a valuable guide to correct diagnosis. In tuberculosis there is often loss of elasticity, as shown by the smoothing out of the rugae, and a wasting of the cellular tissues immediately beneath the dermis. Adhesion of the skin to the epididymis is a well-known sign, as is also a sinus discharging creamy pus. A comparison of the mobility of the two testicles is sometimes helpful. The normal organ can be moved freely within its coverings particularly in an upward and downward direction. This movement is often restricted in tuberculosis. In the advanced stages of the disease there is the craggy nodular epididymis and the

thickened vas deferens with its bead-like prominences.

4. Examination of the Urethra, Prostate and Seminal Vesicles: As has already been pointed out, the variety of genital tuberculosis which is due to an extension of the disease from the urinary tract commences as a urethritis. The discharge is frequently insignificant, and often absent, but if the tuberculous lesion is associated with a secondary infection the discharge takes on the characteristics of that observed in chronic gonorrhea. The correct diagnosis need cause no difficulties, provided that the investigation is thorough, and there is a complete bacteriological study of the urethral discharge.

The only method available for examination of the prostate and seminal vesicles is that of palpation with the finger through the wall of the rectum. Nodules in the prostate, recognized by sense of touch, indicate extensive involvement of this organ. Likewise, when the seminal vesicles are felt as pencil-like bands extending in an upward and outward direction from the upper margin of the prostate the prognosis is equally bad. It must be stressed that in the earliest stages of the disease a failure to note any changes by palpation in the consistence or size of these accessory sexual organs does not exclude tuberculous invasion.

5. Co-existence of Renal tuberculosis: Patients with genital tuberculosis should always have a most thorough examination to establish the possible co-existence of renal tuberculosis, such a combination occurring much more frequently than has been generally recognized.

Differential Diagnosis

The difficulty in accurate diagnosis of swellings of the testicle has been emphasized so much, and yet these difficulties are the result of ignorance and incomplete investigation. If the examination is confined to palpation of the genitalia alone it is obvious that grave errors in diagnosis will be made.

There are certain infective processes, both local and general, which may simulate genital tuberculosis. One of these, for

which the clinician is not quite so alert as he might be, is the epididymo-orchitis of *Bacillus coli* origin. The presence of the *Bacillus coli* in the urine is sufficient to dispel uncertainty. In this type of the disease the severity of the constitutional disturbances, high fever, etc., followed by sudden acute pain and swelling of the testicle, are sufficient to exclude a diagnosis of tuberculosis. Moreover an acute abscess of the testicle often occurs, and this is not found in tuberculous epididymitis.

There should be no difficulty in diagnosing the tuberculous testicle from orchitis due to mumps. The extreme pain and severity of the constitutional symptoms in the latter condition bear no resemblance to the clinical manifestations of tuberculosis.

The lesions due to trauma and torsion should not be difficult to rule out; the history, the acute onset and the findings usually limited to the orchid should be helpful in arriving at the proper diagnosis.

Probably the one disease which simulates tuberculous epididymitis more closely than any other is the low-grade infection which may follow gonorrhea, urethral instrumentation, and cystitis due to prostatitis and other lesions of the lower urinary tract. Here again a complete investigation of the bladder, urethra and genitalia, and inquiry into the previous medical history of the patient, will solve the problem.

There are two more diseases which require consideration in the differential diagnosis, namely syphilis and cancer.

Syphilis can be excluded by the result of the Wassermann reaction and the absence or decrease of testicular sensation—a constant sign.

In the usual variety of cancer of the testicle, the diagnosis is made correctly by the increased weight of the organ, its globular shape, and the presence of enlarged glands in the iliac fossa. An hematocele is also sometimes present, a tuberculous testicle never gives rise to a hematocele, nor does it feel heavier than normal, unless a large abscess is present

when the diagnosis causes no difficulty. Rarely, malignant disease may occur in the epididymis only, as a hard nodule, an accurate diagnosis in such cases is extremely difficult.

The presence or absence of a hydrocele has always been stressed as having an important bearing upon the differential diagnosis of testicular swellings. The value of this observation has been exaggerated for experience shows that in all inflammatory lesions of the testicle a hydrocele may be associated. Even in malignant disease when the epididymis becomes involved, a collection of straw-coloured fluid may form between the two layers of the tunica vaginalis.

Exploratory puncture of the hydrocele is an important aid to correct diagnosis in that it permits a thorough palpation of the testicle.

Treatment

There are several distinct schools of thought with reference to therapy. The surgical treatment recommended varies from a careful resection of definitely localized foci to the complete removal of the seminal tract, i.e., the radical operation of Young, in which the seminal vesicles, ampullae, and both lateral lobes of the prostate are removed through the perineum, after which the epididymis and vas are extracted through the groin. This is a formidable procedure. This operation has introduced an immediate postoperative mortality which in the experienced hands of Young himself reached 4 per cent in one of his series. The radical operation may result in a brilliant success, but is rather more likely to result in large tuberculous perineal fistulae, with complete incontinence of urine.

In an exhaustive review of the literature the results obtained by simple removal of the external focus by epididymectomy or castration are very bad. The prognosis of genital tuberculosis in the male is not very good regardless of the type of surgery employed.

Myl made the observation that of all forms of extra pulmonary tuberculosis being treated by helio-therapy, those with

genito-urinary involvement appear to progress most favorably and rapidly. It would seem that heliotherapy, is particularly applicable in this type of disease. He concluded since genito-urinary tuberculosis is a local manifestation of general disease, that local surgical treatment besides being uselessly mutilating, cannot be curative; and that heliotherapy arrests the progress of pathologic change and seems to promise a cure of tuberculosis of the genito-urinary tract.

Shultz reported on 128 cases of genito-urinary tuberculosis treated by heliotherapy. Out of 64 genital cases, 26 are clinical cures, 33 improved, 5 stationary. Perhaps it would be better to call the clinical cures arrested cases, since they may, under adverse circumstances again become active as do pulmonary cases.

Our Method of Treatment: It occurred to us that if the primary principal focus of involvement of the genital tuberculosis were irradiated directly in addition to local and general radiation treatment, the results would be more certain and more rapid, and reactivation would be less likely to occur.

The prostate gland and seminal vesicles are rayed through a proctoscope with the water-cooled lamp using a special applicator. It is inserted to full depth to ray the seminal vesicles, then it is withdrawn about one-third for the upper part of the prostate, then about a second one-third for the lower portion, always keeping above the external sphincter in order not to blister its mucous membrane. First one side is treated, then the other by changing the direction in which the applicator points. In this way all of the tissues are irradiated, beginning with five seconds' exposure which is gradually increased up to 15 seconds for each area.

The scrotum and its contents are given local treatments with the water-cooled lamp just short of the point of blistering the skin. The scrotum is divided into five areas on each side and five second's exposure is given to each, with burner, at contact distance, without overlapping. The time is increased up to 15 seconds as tolerance increases. In addition, gener-

al actinic ray treatments are given for their physiological action by heliotherapy according to the Rollier method or general body radiations by the air-cooled quartz mercury lamp. The chest is not exposed where there are active soft lesions, but no hesitancy is felt in exposing the chest where there is any fibrosis at all. The advisability of this was brought forth by Cooper. These treatments are given daily at first, then every other day, when marked improvement takes place.

Other local treatment consists of removal of free pus in cases in which the lesion is superficial, and easily accessible. Abscesses of the scrotum should be aspirated, the needle being inserted through healthy tissue, and thus into the abscess. The procedure is repeated as often as necessary to keep the abscess drained. Photodynamic dyes such as gentian violet, or mecurochrome, are used by application or irrigation to the scrotum and draining sinuses.

It is of the utmost importance not to forget rest, diet, and hygienic outdoor existence, such as is carried out in a well regulated sanatorium.

It is maintained that a large number of persons are rendered sterile by genital tuberculous involvement so that we recommend a prophylactic ligation with removal of a small portion of the vas on the opposite side in selected cases.

Results

After a few days of apparent reactivation, the prostate and seminal vesicles begin to be less tender to pressure, nodules seem to be less firm and gradually decrease in size until only the presence of some fibrous tissue keep them from feeling entirely normal. It seems that these structures, under direct radiation, yield much more readily than do the scrotal lesions. The epididymitis after a few treatments shows apparently an activation of symptoms. There is a slight recurrence of local pain or aggravation of it if it is still present. The hard indurated areas soften, and soon break down. There is apparently a stirring up of the general system to active reaction, in contrast to

the sluggishness before, which allowed the smoldering local process to progress slowly.

An abscess develops and discharges. The local diseased area is expelled, the tissues heal, and that is the end of that particular focus. One after the other, these local foci are eradicated in this way until the disease is healed. When the foci are small, they are evidently absorbed without going through the process of breaking down. If the lesion is already an open one when treatment is begun, it readily heals. The mixed infection is quickly sterilized by the bactericidal action of the ultra-violet rays, and the process is then identical with that of the closed lesion. In these cases we believe that healing is hastened

by the application of, and irrigation with the photodynamic dyes in contrast to the long, never healing, pus-discharging sinuses in other forms of treatment.

Comment

Genital tuberculosis is a local manifestation of a general disease the ultimate cure of which depends upon the resistance of the patient to the attacking organism.

Heliotherapy has a decided effect upon the healing of genital lesions, and if carried out thoroughly and properly it will not be necessary to resort to surgery.

Quartz-light therapy has been included by us in the treatment of urogenital tuberculosis for the past nine years. The results have been uniformly encouraging.

Mantoux Reaction in Contact and Non-contact Children

THE tuberculin reaction is almost 50 years old, yet its value has not yet been universally recognized. There have been numerous waves of popularity and disfavor. Lately it is again drawing considerable attention after more than a decade of neglect. Hendricks¹ advises a wider use of the tuberculin test. Moorman² contends that a positive reaction warrants a diagnosis of tuberculosis and a watchfulness for all the ramifications that such a diagnosis entails. Harrington and Myers³ advocate its use in the control of tuberculosis in the human family. Public health agencies everywhere are making wider use of the test.

In doing the routine Mantoux test on children at the Richmond Tuberculosis Clinic of the Department of Health, of the City of New York, we were rather surprised at the extremely high incidence of positive reactors in children from contact families in all age groups as compared to the remarkable low incidence of reactors in children from non-contact families. A review of the literature reveals the extreme variations in the percentage of such reactors in different localities.

BY
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A study of the contagion of tuberculosis made at the Henry Phipp Institute⁴ demonstrated that few, if any, children exposed to contact with open tuberculosis occur with great frequency in the families of which some member suffers with open tuberculosis and that children in contact with tuberculosis develop the disease with greater frequency than children with no contact."

At Bellevue Dispensary⁵ however, among 1695 children tested with tuberculin, no greater amount of tuberculosis was found among children with tuberculous parents than among children from normal parents. The reaction was positive in 64 per cent of the first group and in 66 per cent of those in the second group.

In Farmingham, Massachusetts⁶, tests of school children were made in 1917 and 1926. Of the children between the ages of 3 and 7 who were examined in 1917, 44 per cent were reactors but in 1926, among the children of the same age group, only 20 per cent gave positive reactions.

Charles Hendee Smith⁷ reports that in the Bellevue Yorkville district of New York City in 1923 "our positive reactions

to tuberculin are becoming less and less in number."

Myers recently wrote⁸:

"Is it not time that the medical profession made some investigations throughout this country to determine whether the figures so often quoted concerning the incidence of tuberculosis are true? Two generations have grown up since the original tuberculin tests were administered. Is the tuberculin test positive in as high a percentage as it was then?"

As an answer to this question to ascertain the present incidence of tuberculosis infection among children in New York City, the records of intracutaneous tuberculin tests during the years 1930, 1931, and 1932 were assembled by Drolet⁹ working under the committee of the Association of Tuberculosis Clinics of Greater New York, of which Dr. Ornstein is Chairman. Of 6,080 hospitalized children tested, 35 per cent were positive in the contact group and 10 per cent in the non-contact group.

Among 6,429 children attending tuberculosis clinics in various parts of New York City, positive reactions averaged 49 per cent. Grouped according to contact, 53 per cent were positive; negative history of contact, 33 per cent. By age, among those under one, 19 per cent were positive; all under five years, 39 per cent; those five to ten, 46 per cent; and those ten to fifteen, 59 per cent.

Recent surveys in other cities with intracutaneous tests show the following reactors:

Chicago, 15 per cent; Philadelphia, 69 per cent; 14 per cent in Detroit; Minneapolis, 47 per cent; San Francisco, 24 per cent; and London, 43 per cent.

Thus we see that a great mass of evidence has been collected from a variety of localities relating to the incidence of infection in the general population as manifested by the Mantoux test. Although the specific figures of these studies vary considerably, a few general indications come out of all of them. These may be summarized briefly as follows:

1. There is a great discrepancy between the number of positive reactors in var-

ious communities.

2. As a general rule, most communities show a much higher incidence of positive reactors in the contact groups than in non-contact groups.

3. The relative incidence of reactors in any community and the value of the test from various angles can be determined only by a specific survey for that community.

Although 626 cases are a small group to draw any impressions from relative to the results of intracutaneous tuberculin testing, we feel that they present some interest due to the fact that they are not simply the results of the Mantoux Test of 626 children, but instead, a more or less thorough study of 626 cases from contact and non-contact families. These studies are made from a clinic in which the patients are intimately known to the members of the staff of that clinic, particularly to the nurses. Many of these families are known back to the second generation. This is because the population is a more or less settled one and the small staff has been responsible for practically all of the cases in the borough.

The community is a relatively large one in area, but sparse in population, with most of the cases drawn from homes in uncrowded sections. All these factors naturally influence the results reported as will be seen by a study of the tables.

TABLE NO. 1

<i>Result of Mantoux Test 0.1 mg. O. T.</i>		
626 children		
Positive 274 — 44%		Negative 352 — 56%
<i>Analysis according to age groups</i>		
0 - 5 Years		
Pos.	132 — 21%	Neg.
66 — 50%		66 — 50%
6 - 10 Years		
Pos.	233 — 38%	Neg.
89 — 38%		144 — 62%
11 - 15 Years		
Pos.	261 — 42%	Neg.
136 — 52%		125 — 48%

Table No. 1 is a resume of the total number of 626 children that were tested with 1/10 milligram of old tuberculin, intracutaneously. The reactions were all read after 48 hours and although reported here as positive or negative; in our clinic files they are graded according to 1, 2, 3, or 4, following the general rule of other workers. The children tested were from infancy up to 15 years of age. There was an occasional test made of a child above 15 years of age, but in as much as the Department of Health Clinics consider a patient over 15 as an adult, the study only included children up to 15 years.

Of the total number of 626 children, 274 or 44 per cent gave a positive reaction, and 352 or 56 per cent negative.

When analyzed according to age groups, 132 or 21 per cent fell into the first bracket, or up to the 5th year; 233 or 38 per cent into the second bracket, 6th to 10th year; 261 or 42 per cent into the third bracket, 11th to 15th year.

Of the 132 children in the first bracket, 66 or 50 per cent were positive and 66 or 50 per cent negative. In the second bracket of 233 children, 89 or 38 per cent were positive and 144 or 62 per cent negative. Of the 261 children in the third bracket, 136 or 52 per cent were positive and 125 or 48 per cent were negative.

Unlike the figures of other groups studied elsewhere, we do not find any marked increase of the positive reactors with increasing age.

TABLE NO. 2

Analysis according to exposure
626 children

Contact	
366 — 58.5%	
Pos. 258 — 70.2%	Neg. 108 — 29.8%
Non-contact	
232 — 37%	
Pos. 38 — 16.3%	Neg. 194 — 83.6%
Doubtful contact	
28 — 4.4%	
Pos. 11 — 39%	Neg. 17 — 61%

Table No. 2 is an analysis of the 626 children according to the history of exposure to tuberculosis in their family, or absence of exposure to tuberculosis.

Three hundred and sixty-six or 58.5 per cent of these children gave a definite history of contact to tuberculosis, 232 or 37.1 per cent gave a definite history of non-contact. There were 28 or 4.4 per cent doubtful contacts which could not be definitely classified. A study of the 366 contacts showed a preponderate number; 258 or 70.2 per cent positive, 108 or 29.8 per cent were negative. In the non-contact group of 232 children, only 38 or 16.3 per cent were positive and 194 or 83.6 per cent were negative. In the doubtful group of 28 children, 11 or 39 per cent were positive and 17 or 61 per cent were negative.

Immediately one sees the importance of classifying the children into these two groups, contact and non-contact. However, the marked difference in percentage of reactors becomes more evident when we consider Table No. 3 where the source of contact was an open or caseous pneumonic lesion or a closed or productive type of phthisis.

TABLE NO. 3

Analysis of contacts according to exposure to open or closed or caseous pneumonic or productive phthisis

366 children

Open contact	
271 — 74%	
Pos. 236 — 87%	Neg. 35 — 13%
Closed contact	
95 — 26%	
Pos. 23 — 24%	Neg. 72 — 73%

Of the 366 contact children, 271 or 74 per cent were found to be exposed to the open form of tuberculosis. This is a relatively high number because the clinics naturally draw patients from families that have far advanced tuberculosis. Of the 271 open contacts, 236 or 87 per cent were positive and only 35 or 13 per cent were negative.

In the closed contact group of 95 children, 23 or 24 per cent were positive and 72 or 73 per cent negative.

TABLE NO. 4
Analysis of non-contacts
232 children

Pos.	Neg.
38 — 16.3%	194 — 83.6%

An analysis of the non-contacts of which there were 232, showed 194 or 83.6 per cent to be negative to the Mantoux test with 38 or 16.3 per cent positive reactors.

TABLE NO. 5
Analysis of doubtful contacts
28 children

Pos.	Neg.
11 — 39%	17 — 61%

Table No. 5 is a brief analysis of the 28 children of doubtful contacts. 11 were positive; 17 negative.

Of course, we hesitate to draw any conclusions from this brief analysis. However, should further studies continue to bear out these figures, we feel that one cannot help but come to the following conclusions:

The incidence of positive and negative reactors to the tuberculin test varies entirely with the community and appears to be dependent to a great extent, on the social, economic, and housing conditions of the community. In a community such as the Borough of Richmond, where the area is sparsely settled, the positive reactors will be relatively lower than in communities where there is a thickly settled population with considerable crowding.

Furthermore, the positive reactors usually come from homes in which tuberculosis exists and particularly from the open case of tuberculosis. The opportunities of this community for contracting the tuberculous infection outside the home, are rather rare. If these conditions are accepted, even in part if not entirely, it seems to us that a new method of case finding can be employed in such communities by the universal use of the simple, intracutaneous tuberculin test in children.

The discovery of a positive reactor

should lead one to suspect the presence of an open case of tuberculosis in that reactor's environment, and steps should be taken to discover that open case. Such open cases often exist without the knowledge of either the afflicted or members of his environment, and the discovery of a positive reactor will often be the clue to the presence of such an open case.

Weber, Murphy, and Holcomb¹⁰ have recently utilized this reasoning in a survey of school children in Ulster County, New York. They tested about 5000 children and then attempted to bring in the members of the immediate family of the positive reactors in an effort to discover the presence of adult pulmonary tuberculosis in that child's environment. They were able to examine and x-ray 537 parents of positive reactors. In that group, they discovered 11 cases of minimal pulmonary tuberculosis and 9 cases of moderately advanced tuberculosis. There were 7 suspicious cases.

Although such a study is fraught with many complications, it seems to us worth while in the light of what these investigators have done. We believe that this form of case finding and surveys has a definite value in the search for all forms of tuberculosis and should be further encouraged.

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Pulmonary Manifestations of Coccidioidal Granuloma *

WITHOUT elaborating in great detail upon the historical data relative to the disease in this short dissertation—and I might add this has been described adequately and thoroughly by those pioneers working with this subject—suffice it to state that the proven causative factor is the coccidioides immitis. There are various and uniform descriptions of the irregular protoplasmic body with a double contoured, highly refractive surrounding membrane or capsule, and they multiply by sporulation.

Fifteen or eighteen years ago Coccidioidal Granuloma was described as a California disease, but that empty honor has been largely dissipated; as quite a sizeable number of cases have been uncovered in contiguous states and those far removed from this section, and many individuals who have never visited the state. In contrast it is a direct compliment to the diagnostic acumen and alertness of the examining physician. Nevertheless, the preponderance of cases reported have spent a period of time in the San Joaquin Valley.

Most observers have concurred in the opinion that the mode of entry may be either through an abraided skin lesion or the inhalation of dust, and the action of the fungi upon the host in producing a lesion either of an acute or chronic manifestation is directly attributable to the virulence of the invader. Heretofore, the reports relative to coccidioidal granuloma have dealt with pulmonary manifestations only in a casual manner, and it is my thought that we might intensify interest in a small way if we attempted to delve more into detail as regards the picture in that field which we are particularly interested. The thoughts incorporated in this paper represent a compilation of my own opinion plus the pathologic reports.

BY
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Reeking with possibilities is the differential diagnosis, and since tuberculosis is the most common offender we find this confusion is not wholly confined to the pulmonary picture, but the bone involvement, which is concomitant in many cases is equally as difficult to solve. Since our thoughts are to be confined to the chest picture, we offer the following diseases to be differentiated.

1. Miliary Broncho-pneumonia or Bronchiolitis.
2. Miliary Tuberculosis—acute or chronic
3. Miliary Carcinomatosis.
4. Second stage Silicosis.

Case Histories

Case No. 1: September 28th, 1934 the patient accidentally injured his hand. The extent of the injury was simply a skin abrasion between the third and fourth metacarpal bones. Subsequently, he would occasionally in the course of his work tear off this superficial crust. At no time was the injury sufficiently incapacitating for him to consult a physician. On or about October 17, 1934 he began to have a constricted sensation through the chest. Associated with this was fatigue, night sweats and inertia. He was seen off and on until October 28, 1934 when he apparently became gravely ill and was sent to the County Hospital in San Diego. At this time his complaint was an inability to open the jaw, markedly high temperature, and some rigidity in the neck musculature. History taken at the County Hospital was not particularly complete as he was unable to answer questions with any degree of certitude. He was employed at the time of his illness on an irrigation project in the vicinity of La Mesa, California and his particular work was tamping the dirt in and around the large flume pipes and he was exposed to considerable dust. He demise occurred three days after arriving at the hospital. Post-mortem

*Read before the California State Medical Association at Del Monte, California, May, 1937.

findings show a healed abrasion 2 m.m. in diameter on the back of the right hand between the third and fourth metacarpals above the base of the finger. Brain appears oedematous and the pia-arachnoid is markedly congested. *Lungs* are involved with a lobar pneumonia in the stage of red hepatization, and there were many small caseous cavities, surrounded by a dense fibrotic scar, which was most suggestive that they were tuberculous in origin. *Microscopic*. Surrounding the necrotic areas we find a fibrosis which is quite dense in some places, indicating the process had been present for considerable period, and farther removed from the necrotic area we find an increase in fibrosis with obliteration of the lung alveoli. A few typical spheroidal organisms were found within the giant cells. This man undoubtedly died from a terminal pneumonia and meningitis, although no coccidioides were found in the meninges. Injury to the hand was an irrelevant matter.

Case No. 2: For the past two years he had been employed by a number of construction companies. The major portion of this employment was in San Diego County. October 19th, 1934 he had a great deal of epigastric distress, and an excruciating pain throughout the upper quadrants. Cholecystitis was suspected and he was operated upon, but no gall bladder pathology was noted. Coincident with this he was complaining of chest pains of an indefinite character and night sweats at this time were very profuse.

Physical Examination: I saw this individual subsequent to the operation and at this time he possessed numerous skin lesions—some of which were papular—others papulo-pustular. By the latter I mean a papular base with a pustular apex. These were approximately 1 c.m. in diameter with elevated edges and a depression in the center. These were indiscriminately located over the body and no predilection for any one portion. There was a moderate cervical adenopathy, particularly upon the right side. The chest revealed an enlarged hilus with retrogressive changes in the right lung indicative of recent pathology, and in the left there was a

pneumonia with a great deal of thickening at the left base. The abdomen showed a recent operative wound as yet unhealed. Films of the chest taken October 25th showed only an enlarged hilus; those taken October 31st evinced pneumonic areas in the upper left. Filmed again November 5th shows the right lung clear with an extension of the pneumonia to the left base. Filmed again five days later showed a generalized pneumonia involving all lobes of both lungs. The diagnosis of fungus coccidioides was made easy by the examination of the skin lesions.

Post Mortem Findings: In this case the gross findings were one of red and gray hepatization. No cavitation was present.

Microscopic: The picture is one predominantly of epithelioid tubercle formation, and there is quite a central caseation necrosis in a few of these. The acute character of the disease was evidenced by the parenchymal involvement and a general filtration into the kidneys, liver and spleen, with very little protective response on the part of the host, in other words fibrosis was apparently lacking, and the spheroid organisms were present in many tissues of the body.

I would like to incorporate the findings of another case in which the pulmonary pathology was most interesting and one which I had an opportunity of studying and I think it exemplifies some of the points I wish to bring out. In this case the visceral pleurae was sanded by fine miliary lesions, and oft times these can be felt easier than seen. There was a large, firm caseous enlargement of the lymph nodes immediately above the tracheal bifurcation, a total mass almost as large as a golf ball. This structure on section shows almost total replacement of lymphoid tissue by a mixed caseous and purulent granuloma formation in and around the nodes with a rather slight peripheral fibrosis. Granuloma nodules of walnut size were found near each apex, adherent to both visceral and parietal pleurae, a somewhat larger nodule at the right base, and three or four scattered smaller nodules throughout the lung. All showed muco-purulent centres with a

granuloma-like wall and the gross appearance being closer to that of a lung abscess than one of a tuberculous origin. The bronchi was filled with stringy mucus and the entire bronchial tree was thickened and semi-bronchiectatic. In this particular case the pulmonary lesion would suggest a primary involvement of the tracheal and bronchial nodes, lymphatic spread along the bronchial tree with subsequent development of the dozen or so nodular lesions scattered through both lungs and then a final miliary explosion through the lungs, liver, spleen and kidneys.

In a portion of the cases herein enumerated two types of coccidioidal lesions are present. The older lesions are situated along the bronchial tree and represented by fibrosaceous granuloma tissue with considerable old dense scar tissue, much active fibro-blastic tissue peribronchially arranged, together with giant cells, caseation and coccidioidal bodies. The other lesions are more parenchymal scattered throughout the alveolar apparatus although often adjacent to small blood vessels. These lesions are small, resemble miliary tubercles, measure $1\frac{1}{2}$ m.m. or less and are apparently of the same age as those we find when we have a terminal explosion and probably the occidiodal spores spreading via the blood stream.

I feel in all of the cases described here the oldest lesion is that in the tracheal nodes and the inhalation infection is obvious. The peri-bronchial spread probably lymphatic in origin is also not to be doubted as the peribronchial lesions are older and more fibrotic than those more peripheral in the lung. Fibrotic lesions such as these are known to persist for years both in experimental animals and in human cases. On the other hand quite dense fibrosis can occur in guinea pigs in a few weeks. As a terminal manifestation in practically all these cases there is a miliary dissemination throughout the lung parenchyma, spleen and liver, due to a hematogenous distribution of the spores.

Due to the thick tenacious mucus which is present in some of these cases we find

a very shifting picture through the x-rays. There is a rapid migrating type of pneumonia, which may show evidences of clearing in one lung with an extension in the other; also, localized areas of atelectasis and this may approach a more or less massive collapse.

Medico — Legal Aspect

The question invariable arises in a given case—what is the incubation period and did the applicant acquire his disease while working upon this certain project? In as much as the source of infection is not definitely known and the atrium of infection in a specific case is problematical, the period of incubation is unknown. I might add there is no record of human case to case infection.

Two of the cases herein described were employed upon the same project each less than three months—approximately one half mile apart. The illness in each case consumed only two to three weeks before exitus. Each was exposed to dusty atmosphere. The applicants' claims were filed simultaneously and at this time the problem was entirely new to the Industrial Commission.

We proved, and legitimately so, that chronicity is present in certain of these cases, and that was amply demonstrated by the fibrotic changes in the tracheo-bronchial glands. Surrounding the necrotic areas was a certain attempt towards fibrosis, and a review of 50 cases in 1929 by Evans and Ball disclosed interesting data relative to duration of $9\frac{1}{4}$ months—and the greatest period consumed was 62 months. It was our conception that the infection had been present for longer than the period of time in which they had been employed upon this particular project. I believe it is consistent with our present knowledge of this disease to say that the primary pulmonary focus may remain dormant in the lung for many years before becoming active, such as may occur and often does occur in tuberculosis. So much for our proof of chronicity. Our next step was to prove the so-called "Risk of Commonalty." By this I mean that anyone in a given community in which the disease

occurs is a potential risk and by reviewing the various occupations of the sufferers of this disease we find a great dis-

parity. The Commission established a precedent and ruled they were non-industrial.

Points of Technique in Artificial Pneumothorax

BY

JOHN S. PACKARD, M.D.*

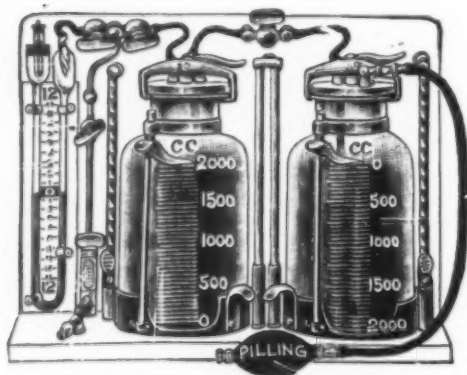
Allenwood, Pa.

DO —

1. Asepsis

- (a) Scrub hands thoroughly.
- (b) Sterile gloves and drapes.
- (c) Autoclaved needles. (Dry needles produce free manometer oscillations.)

- 2. Blunt needles in initial treatment avoid wounding visceral pleura and causing spontaneous pneumothorax.



- 3. Always have manometer open during entire treatment. Any change in intrapleural pressure is detected instantly.
- 4. Fluoroscope pneumothorax patients routinely, and check frequently by x-ray. Otherwise, a re-expanded lung or re-opened cavities result.

*Methods of administering artificial pneumothorax differ widely in various parts of the country, and this paper makes no attempt to set itself as a standard of excellence. The points to follow are merely given in the light of the experience of the group working in one sanatorium over a period of fifteen years.

- 5. Aspirate proven or probable tuberculous primary pleural effusions and replace with air or gas; thus a converted pneumothorax can be maintained. Fifty per cent of patients with primary effusions later develop active tuberculosis. Pneumothorax cannot be induced long after effusion is resorbed or aspirated.

DO NOT —

- 1. Insufflation must not begin until manometer fluctuates freely. Poor oscillations heighten the danger of air embolism.
- 2. Never give more than 250 c. c. at initial treatment. Danger of tearing fine adhesions, and of spontaneous pneumothorax increases with large insufflations.
- 3. A safe maximum refill is usually 300 to 450 c. c. Sudden stretching of adhesions by large refills is probably a factor in pneumothorax affusions.
- 4. Never allow pneumothorax effusions to remain indefinitely. Without aspiration and replacement by air or gas, the collapsed lung re-expands under the fluid.
- 5. Never continue an ineffective pneumothorax. An unclosed cavity here calls for the severance of adhesions, phrenic crush, or thoracoplasty.

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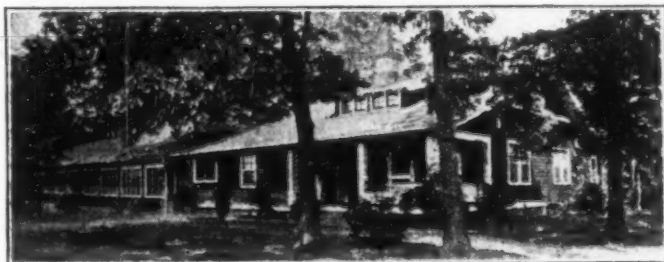
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Diagnosis of Pulmonary Tuberculosis *

WITHIN the past few years there has come about a reversal in the relative difficulty in diagnosing and treating pulmonary tuberculosis. Formerly the diagnosis was considered difficult and the treatment certainly was simple, while now in the vast majority of cases the diagnosis is easy but the proper management and treatment has become extremely complicated.

A few factors in regard to tuberculosis should always be kept in mind. It must be remembered that any person, regardless of age, resistance, or general condition of health will have the disease if a sufficient number of tubercle bacilli enter the body. Therefore, the history of more than casual contact with an open case is of vital importance in leading one to suspect the presence of tuberculosis. Every person who has had intimate and prolonged contact should have a chest examination regardless of the presence or absence of symptoms, because they are usually slight and often entirely absent in early tuberculosis.

Also the diagnosis must be established or eliminated in those who have more or less chronic local symptoms referable to the respiratory tract. There are exceptions, but usually general symptoms do not occur in tuberculosis unless local ones are also present. The local symptoms most commonly encountered are cough, expectoration, hemoptysis, pleurisy, and laryngeal irritation; the general symptoms most often found are malaise, anorexia, loss of weight and strength, lack of endurance, indigestion, and fever. Of course, all of the foregoing are also symptoms of many other diseases and not all appear in every case of tuberculosis. Together with other data symptoms must be given considerable weight but no symptom or group of symptoms is path-

BY

F. C. WHELCHER, M.D.

Alto, Georgia

ognomonic. Dry pleurisies not accompanied by acute infections, must be looked upon with utmost suspicion as nearly all are tuberculous. The same is true of pleurisies with effusion and unless otherwise accounted for should be so regarded.

The physical signs that may be elicited are so well known that little need be said about them. By far the most important is the presence of moderately coarse post-tussive rales, and when found in the upper third of the lung are nearly always due to tuberculosis. If heard at the bases they may be of no pathologic significance. However, in minimal lesions, rales, as well as all other signs, are often entirely absent.

The more frequent use of the x-ray has demonstrated beyond all doubt the futility of attempting to diagnose and define small tuberculous areas by means of decreased expansion, supraclavicular depressions, slight impairment of percussion note, prolonged expiration, granular breathing, and by palpation. These methods and signs are valuable in their places, but practically are useless in establishing a diagnosis of minimal tuberculosis, or in demonstrating the absence of minimal lesions. Physical signs are also most unreliable in revealing the exact extent and character of more advanced disease.

A number of factors have been responsible for the more satisfactory diagnosis of tuberculosis, but unquestionably the x-ray has been the most important. The number of minimal cases that can be diagnosed without its aid is almost negligible, and no other methods of examination will give so accurate a knowledge of more advanced disease. To be of value, thoracic roentgenograms must be technically satisfactory as attempts to interpret poor films will lead to many serious errors. The next essential is that one be thoroughly familiar with the shadows cast by normal structures. This cannot be

*Read before the Medical Association of Georgia, Macon, May 13, 1937. Reprinted from The Journal of the Medical Association of Georgia.

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emphasized too much since there is a wide variation in shadows produced by normal chests. This is especially true of the region in and near the hilum and of the descending trunks. The interpreter should be very sure of his ground when stating that these shadows are abnormal. Also because of the normal variations in linear markings, a diagnosis made on slight peribronchial infiltration alone is not justified. It is necessary also that one have a clear conception of the various types and characteristics of infiltrations caused by different pulmonary diseases.

Adult tuberculosis generally begins in the upper third of the lung and is seen on the roentgenogram as soft mottled shadows in the apex, or as a small dense area of infiltration below the clavicle. The moderately and far advanced lesions present such a variety of pathological shadows that a knowledge of the characteristics of all stages can be gained only by the examination of many films. Often on one x-ray of the chest may be seen the shadows of mottling, calcification, fibrosis, consolidation, and cavitation. Somewhat similar shadows are produced by diseases other than tuberculosis, but as a rule, if due consideration is given to the size, consistency, uniformity and distribution, certain essential characteristics will be found which will reveal the true nature of the process.

The laboratory furnishes the only pathognomonic sign of tuberculosis and that is a positive sputum. Because of the possibilities of error, acid-fast bacilli should be demonstrated more than once, and a negative sputum should be examined repeatedly. It should be remembered that patients who expectorate muco-purulent material which is repeatedly negative for tubercle bacilli must be suspected of having some non-tuberculous disease. Animal inoculation with the suspected material is advisable at times. It has been about 55 years since Koch discovered and proved that tubercle bacilli cause tuberculosis, but too often a sufficiently diligent search for the organisms is not made.

The tuberculin skin test has been found to be of much value in arriving at correct

conclusions in regard to the exact nature of pulmonary pathology. It is indispensable in diagnosing childhood type tuberculosis and also very valuable in doubtful adult cases as a surprisingly large number will be found to be negative. This is especially true of the rural population, and a negative skin test, when the few exceptions are remembered, places an almost insurmountable burden of proof for a positive diagnosis on the history, symptoms, signs, and x-ray.

The diagnosis of childhood or first infection type tuberculosis is so entirely different from that of the adult that separate consideration is necessary. In suspecting the disease in children the history of exposure is by far the most important factor. The state of nutrition and the general health are usually entirely normal. Frequently there are no symptoms whatever that would indicate the presence of tuberculosis. If such symptoms as chronic cough, expectoration, fever, loss of weight and strength are present it nearly always means that tuberculosis is not the causative factor. These symptoms occurring in a child may be the result of a hopelessly advanced adult type lesion, but in the vast majority of instances are caused by bronchiectasis or lung abscess.

The most common errors made in interpreting roentgenograms of the chests of children result from attributing broad and blurred mediastinal shadows to tuberculosis; this is insufficient evidence and nearly always is due to cardiac motion; also by interpreting all densities in the hilum as calcification. Practically all chest films show small round or oval dense areas in the hilum, most of which are due to blood vessels struck axially by the rays and are entirely normal. However, a positive diagnosis of childhood type tuberculosis can be made with great assurance of correctness by a careful consideration of the history, by the elimination of other pulmonary conditions, and by obtaining a positive skin test and a characteristic roentgenogram. A diagnosis of childhood tuberculosis is not justified unless both a positive skin test and positive x-ray findings are present.

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Time permits only a brief mention of a few of the many conditions that may simulate tuberculosis. Of these bronchiectasis is the most common and it often produces every sign and symptom of tuberculosis except a positive sputum. The onset of symptoms can generally be traced back to an attack of pneumonia, measles, whooping cough, scarlet fever or sinusitis. The bronchi of the lower portion of the lungs are most often involved. The disease can readily be differentiated from tuberculosis by the history, x-ray, negative sputum and the instillation of an opaque iodized oil.

Lung abscess also rarely presents difficulties in differentiation. Ordinarily there is a history of pneumonia, tonsillectomy, or an operation on some part of the upper respiratory tract a short time before the sudden severe pulmonary symptoms occur. Also the possibilities of foreign bodies should be considered.

Fungus infections of the lungs present a picture somewhat like that of tuberculosis and the diagnosis can be made only by finding the organisms in the sputum. It may be mentioned here that care should be exercised in making a diagnosis of bronchiectasis and fungus infections, as iodized oil and the administration of

iodides are definitely dangerous in tuberculosis.

The prolonged inhalation of irritant dust produces x-ray evidence not unlike that of miliary tuberculosis, but the symptoms, and especially the occupational history, are significant.

Primary new growths of the lungs may be confusing, but serial x-ray films and bronchoscopic examination will reveal the non-tuberculous nature of the process.

Subacute non-tuberculous pulmonary conditions occur fairly frequently after "colds" and influenza. The pathology is generally in the region of the descending bronchi. Again, the history, location, sputum examination, skin test, and x-ray appearance will make the diagnosis clear.

In conclusion, emphasis should be placed on the following: In suspecting tuberculosis the opportunity for infection and symptoms are most important; the adult type of tuberculosis has a strong predilection for the apices, and moderately coarse rales in these areas are almost pathognomonic; thorough study of the sputum should never be neglected, and satisfactory roentgenograms are indispensable. The final diagnosis is made only after a correlation and proper appraisal of all possible findings.

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